EA440 AEROSPACE VEHICLE DESIGN
DESIGN PROJECT
Professor Rogers

Minimum Design Report Requirements

Design Specifications.

Three view drawing – small ($8\frac{1}{2} \times 11$) and large (minimum 1 inch equals 1 foot – see example).

General Performance Specification Sheet (see example).

Detailed inboard profile.

Detailed structural layout.

Detailed instrument panel and cockpit layout.

Detailed seating diagram.

Complete Weight and Balance calculations.

Detailed drag build-up.

Complete performance analysis including but not limited to:

   Range at various powers and velocities (Mach numbers) as a function of altitude.

   Endurance at various powers and velocities (Mach numbers) as a function of altitude.

   Velocity and thrust required for maximum range.

   Velocity and thrust required for maximum endurance.

   Velocity for $(L/D)_{max}$ (maximum glide ratio) with no power.

   Velocity for minimum sink rate with no power.

   Power-off stall velocity.

   Cruise velocities (Mach numbers) vs altitude.

   Fuel flow.

   Take-off distance over a 50' obstacle from SL to 10,000 foot density altitude for various weights starting at 25% fuel, minimum crew to maximum gross weight with no flaps and with optimum take-off flaps.

   Rate-of-climb as a function of altitude from SL to the service ceiling for various weights starting at 25% fuel, minimum crew to maximum gross weight

Velocity for maximum rate-of-climb from SL to the absolute ceiling at maximum gross weight.

Velocity for maximum climb angle from SL to the absolute ceiling at maximum gross weight.

Time, fuel and distance to climb to a given altitude on a standard day for various weights starting at 25% fuel, minimum crew to maximum gross weight. State the engine operating conditions.

Landing distance over a 50' obstacle from SL to 10,000 foot density altitude for various weights starting at 25% fuel, single pilot, no baggage to maximum gross weight with full flaps.

Complete stability & control analysis including but not limited to:

Permissible C.G. envelope diagram and pilot's C.G. calculation sheet.

C_m vs α curve including the effect of tabs.

Stick fixed/free neutral and maneuver points.

Basis for forward C.G. limit.

Stick force as a function of velocity including the effect of tabs.

Elevator and stick force per g as a function of C.G. location.

Maneuver velocity (turbulent penetration velocity).

Maximum crosswind landing velocity and whether rudder or aileron limited.

Longitudinal dynamic stability analysis as a function of C_L and C.G. location.

Lateral dynamic stability analysis as a function of C_L.

Other parameters/conditions as required by the individual design.